AF/1754

TRANSMITTAL LETTER (General - Patent Pending)	Docket No. 7913Z

In Re Application Of: **Donald R. Huffman, et al.**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
07/580,246	September 10, 1990	Stuart Hendrickson		1754	5441

Title: **NEW FORM OF CARBON**

COMMISSIONER FOR PATENTS:

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REPLY BRIEF

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Dated: **August 2, 2005**

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellants:	Donald R. Huffman, et al.	**Examiner:**	Stuart Hendrickson
Serial No.:	07/580,246	**Art Unit:**	1754
Filed:	September 10, 1990	**Docket:**	7913Z
For:	NEW FORM OF CARBON	**Dated:**	August 2, 2005
Conf. No.:	5441		

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REPLY BRIEF

I. INTRODUCTION

Appellants, through their attorney, hereby submit this Reply Brief, pursuant to 37 CFR §41.41, for entry in the above-identified application.

This Reply Brief addresses the issues that were raised in the Examiner's Answer dated June 3, 2005.

II. PRELIMINARY MATTERS

A. 37 CFR. §1.192 IS NO LONGER IN EFFECT AND UNDER THE NEW REGULATIONS, PURSUANT TO 37 C.F.R. §41.37 THERE IS NO REQUIREMENT TO THAT THE APPEAL BRIEF CONTAIN A SECTION ENTITLED GROUPING OF CLAIMS.

At the outset, it is to be noted that the Examiner's Answer's makes reference to the fact that the Appeal Brief does not contain a section entitled Grouping of Claims, citing 37 CFR §1.192 (c) (7). In addition, the Examiner's Answer includes a statement therein that "the rejection of claims on appeal stand or fall together because appellant's brief does not include a statement that the grouping of claims does not stand or fall together

and reasons in support thereof."

However, it is to be noted that appeals formerly governed by 37 CFR §1.191 et seq are now governed by 37 CFR §41, which went into effect on September 13, 2004. According to the new regulations, an Appeal Brief filed after September 13, 2004 must comply with 37 CFR §41.37 which governs Appeal Brief. Under the new regulations, there is no requirement that the Appeal Brief include a section entitled Grouping of Claims. Thus, no negative inference should be drawn by the exclusion of a section entitled "Grouping of Claims" since the inclusion of this Section was not required in the Appeal Brief filed under 37 CFR § 41.37.

Moreover, a review of the Appeal Brief clearly indicates that with respect to each ground of rejection, different reasons were presented to support patentability. Although some of the arguments may apply to all of the claims rejected under a particular ground, the Appeal Brief and Reply Brief provide arguments supporting patentability traversing the rejection which pertain to one group of claims and not to another. These claims are so identified, so that the Appeal Brief and the Reply Brief make it clear which arguments support the patentability of the claims being rejected.

2. A PANEL OF THE BOARD OF PATENT APPEALS AND INTERFERENCES, ISSUED A DECISION DATED MARCH 30, 2005 WHICH APPELLANTS WISH TO BRING TO THE ATTENTION OF THE BOARD

Subsequent to the filing of the Appeal Brief, a panel of the Board of Patent Appeals and Interferences rendered a Decision dated March 30, 2005 respecting, the appeal in U.S. Patent Application Serial No.: 08/236,933. In order to comply with the duty of disclosure, Appellants are making the Board aware of that Decision. If the Board requires a copy thereof, Appellants upon request, would be happy to furnish a copy.

One of the issues decided by the Board in the '933 application is that there is no descriptive support for the term "macroscopic amounts". Based upon the evidence presented in the Appeal, that panel of the Board held that the instant application did not have descriptive support for the term.

However it should be pointed out that appellants filed a Request for Reconsideration on May 31, 2005 which points out, what the appellants believe as the points "misapperended or overlooked" by the Board.

However, that panel of the Board did not have before it Dr. Loufty's testimony, which is indicated hereinbelow and in the Appeal Brief, supports appellants contention that, inter alia the application complies with the written description requirement of 37 CFR § 112, first paragraph. Since the evidence was not considered previously, the appellants respectfully request that the Board consider the Loufty Declaration in conjunction with the evidence of record de novo and hold, based upon the evidence of record, for the reasons presented hereinbelow, that the present application complies with the written description requirement of 35 USC §112, first paragraph.

C. APPELLANTS FILED AN AMENDMENT UNDER 37 CFR §1.116 THAT CORRECTS A TYPOGRAPHICAL ERROR.

The Examiner's Answer indicated that the Amendment dated March 8, 2005 that accompanied the filing of the Appeal Brief was entered. It, however, indicated that the Amendment contains a typographical error in Claim 156. Appellants are submitting contemporaneously herewith a new Amendment, correcting the typographical error. The Examiner indicated in the Examiner's Answer that if Appellants correct the typographical error, the Amendment would be entered.

Entry is therefore respectfully requested, as the Amendment merely corrects the typographical error.

III. THERE IS ADEQUATE DESCRIPTIVE SUPPORT FOR THE TERM "MACROSCOPIC" IN THE SPECIFICATION IN COMPLIANCE WITH THE DESCRIPTION REQUIREMENTS OF 35 USC § 112, FIRST PARAGRAPH

The term "macroscopic", as used in the rejected claims, is fully supported by the underlying specification. The term "macroscopic" as used in the rejected claims is used in association with amounts of C_{60} and/or C_{70}. Contrary to the allegations in the Final Rejection, and/or the Examiner's Answer, in this context, there is adequate support, in accordance with the written description requirement of 35 U.S.C. §112, first paragraph, for the term "macroscopic amount" as it relates to C_{60} and/or C_{70}.

The written description requirement of 35 U.S.C. §112, first paragraph, provides that:

> [t]he specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise and exact terms so as to enable any person skilled in the art to which it pertains or with which it is most nearly connected to make and use the same... (emphasis added).

The written description requirement, which is distinct from the enablement and best mode requirements, serves to ensure that applicants have possession of the invention at the time of the filing of the application. In re Wertheim, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976). In order to meet the written description requirement, the applicant does not have to use any particular form of disclosure to describe the subject matter, but the "description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." In re Gosteli, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989). In other words, the applicants must convey with reasonable clarity to the skilled artisan that as of the filing date he

or she was in possession of the invention. Vas Cath., Inc. v. Mahurkar, 935 F.2d 1555, 1563-64, 19 USPQ 2d 1111, 1117 (Fed. Cir. 1991). Literal support is thus not necessary for compliance with the description requirement. Id.

There is adequate support in the application for the term "macroscopic" in the application. More specifically, support for this term and concept permeate the specification.

The application reasonably conveyed to one of ordinary skill in the art that the inventors had possession, at the time of the filing of the instant application, of macroscopic amount of fullerenes, e.g., C_{60}, as evidenced by reviewing the instant application.

For example, a review of the application on Page 1 and Page 2 clearly shows that the application was comparing the amounts of fullerenes, e.g., C_{60} and C_{70}, prepared by the instant process to that which was prepared in the closest prior art reference, a paper by Kroto, et al. in Nature 1985, 318, 162 (hereinafter referred to as the "Nature 1985 article"), of record. This article describes the experiment in which a solid disk of graphite was vaporized into a high density helium flow using a focused pulsed laser. The resulting vaporized carbon was expanded in a supersonic molecule beam and photoionized using an excimer laser, thereby forming molecular ions. The molecular ions, and not the molecules themselves, were detected by time of flight mass spectroscopy. Based on the results, Kroto, et al. speculated that they identified C_{60} and/or C_{70}; however, so little was obtained that Kroto, et al. could not perform any tests to verify the same. In fact, years later Curl and Smalley, (two of the authors of the aforesaid Nature 1985 article) in Scientific American 1991, 54-63, of record (hereinafter "Curl, et al."), reflected upon the events leading to the isolation of macroscopic amounts of fullerenes, and commented that Kroto, et al. only collected minute amounts of material, which provided indirect evidence of the existence of fullerenes and which was not enough to see, smell, touch, etc.

> Although our evidence was sound and our conclusions were supported by extensive further experiments and theoretical calculations, we could not collect more than a few tens of thousand of these special new molecules. This amount was plenty to detect and probe with the sophisticated techniques available in our laboratory, but there was not enough to see, touch or smell. Our evidence was indirect, much as it is for physicists who study antimatter. For now, the fullerenes existed only as fleeting signals detected in our exotic machines. But as chemists, we knew that the new material ought to be perfectly stable. Unlike antimatter, the geodesic forms of carbon should be quite safe to hold in one's bare hand. All we had to do was make more of them-billions and billions more.

Id. at 54.

The instant application describes that the publication in the Nature 1985 article only postulated the existence of C_{60}, as it indicates, on Page 1, lines 14-31 of the instant specification:

> ... all that was observed was a peak in the mass spectra of said carbon vapor. However, Kroto, et al. did not isolate any of said compound... Yet, to date, no one has been successful in verifying the existence of this molecule since no one has been successful in isolating the molecule in measurable amounts. Thus, no process for producing recoverable amounts of this new compound have been described at the present time. (Emphasis added)

Id.

On Page 2, lines 7-14, the instant specification describes C_{70} and it states at lines 10-13 thereof:

> ...Like the (C_{60}) to date, no one has been successful in verifying the existence of C_{70}. Heretofore, no one has been successful in obtaining the molecule in any appreciable amounts. (Emphasis added)

Id, pg. 2, lines 6-14.

In the SUMMARY OF THE INVENTION the present application further states:

> A process has now been developed for the production of recoverable amounts of C_{60} and C_{70}.... The processes of the present invention produces C_{60} and C_{70} in recoverable amounts and permits realization of the proposed uses described hereinabove. (Emphasis added)

Page 2, lines 16 to 34 of the instant specification.

These proposed uses were the uses proposed in the publication by Kroto, et al. in the Nature 1985 article, in which the authors state the following:

> ...If a large scale synthetic route to the C_{60} species can be found, the chemical and practical value of the substance may prove extremely high. One can readily conceive of C_{60} derivatives of many kinds, such as C_{60} transition metal compounds, be a super lubricant... If stable in macroscopic, condensed phases, this C_{60} species would provide a topologically novel aromatic nucleus for new branches of organic and inorganic chemistry. Finally, this especially stable and symmetrical carbon structure provides a possible catalyst and/or intermediate to be considered in modelling prebiotic chemistry... (Emphasis added)

Nature 1985, p. 14.

A review of Page 2 of the instant specification indicates that these were among the utilities listed in the present application for the new form of carbon, e.g., C_{60} and C_{70}.

Taken together, these passages clearly connote to one of ordinary skill in the art that the present inventors have found a means of producing C_{60} or C_{70}, or both, in amounts that have not been realized heretofore. The amounts referenced to were significantly larger than that produced by Kroto, et al. in the Nature 1985 article. By referring to the utilities listed in the Nature 1985 article, and stating that the invention produces sufficient C_{60} and C_{70} to permit the realization of these utilities, which can only be achieved, as indicated by Kroto, et al., if a large scale synthetic

route for C_{60} can be found, such as if present in macroscopic amounts, it is evident that the amounts referred to in the application through the use of such terms as "appreciable amounts", "measurable amounts" and "recoverable amounts" connote amounts present sufficient to be seen. In fact, as indicated in the Brief, "appreciable" by definition, means "enough to be perceived." See Webster Unbridged Dictionary 2nd Ed. p.91 (1983). Appreciable, when given its broad definition, is consistent with the term "macroscopic". Moreover, "recoverable amounts," and "measurable amounts" when put into this context, also connote large scale amounts, e.g., macroscopic amounts. Thus, put into proper context, the passage on Pages 1 and 2 of the instant specification reasonably conveys to the skilled artisan that the Appellants had produced fullerenes, e.g., C_{60} and C_{70}, in macroscopic amounts.

Moreover, the instant application contains additional evidence that the fullerenes, e.g., C_{60} and C_{70}, were produced in macroscopic amounts. As the instant application describes on Page 6, lines 11 to Page 7, line 12, when the sooty carbon product, prepared by the vaporization of graphite in accordance with the procedure described therein was placed in benzene, it turned brownish-red. Further, attention is directed to Example 1 on Page 16 of the instant specification, wherein it specifically exemplifies the preparation of the sooty carbon product in accordance with the present invention and the extraction thereof with benzene to produce a wine-red to brown color. The fact that the benzene solution was colored is significant. Appellants indicated that this indicated to one of ordinary skill in the art that macroscopic amounts, e.g., C_{60}, were present therein. The Examiner's Answer, questioned whether this amount was sufficient to connote macroscopic amounts to one of ordinary skill in the art.

Again, the answer is in the affirmative. As evidence thereof, reference is again directed to Curl, et al. which described that since the publication of the 1985 Nature article, scientists

from all over the world were trying to make fullerenes, e.g., C_{60} and C_{70}, in macroscopic amounts. As stated therein:

> Thus, for five years, we had been searching for a method of producing visible amounts of the stuff. We called our efforts "the search for the yellow vial" because quantum calculations for such a soccerball-shaped carbon molecule suggested it would absorb light strongly only in the far violet part of the spectrum...
> In our laboratory we collected the sooty carbon produced by the vaporization laser while using various chemical techniques to detect the presence of C_{60}. We slurried the soot in benzene, for example, and looked for a yellow color. But the solution in our test tubes stayed clear, with boring black soot sitting on the bottom.
> ...When the Krastchmer-Huffman group finally added benzene to their camel sample and saw the color red develop, they realized they were looking at the first concentrated solution of fullerenes ever seen. They evaporated the solvent and found that tiny crystals remained, which readily redissolved. The crystals could be sublimed under a vacuum near 400 degrees Celsius and condensed on a cold microscope slide to form smooth films of solid materials, which Kratschmer and Huffman christened "fullerite"...
> In thin layers, these films were yellow (a fact that those of us at Rice University who searched for a yellow vial found highly gratifying). (Emphasis added)

Id, at Pages 55 and 57.

Thus, a competitor of the present inventors had correlated the colored solution of benzene containing the fullerenes, e.g., the C_{60} product, with "visible amounts", i.e., macroscopic amounts of same. As one reads the article, it is quite apparent that the whole thrust of the article was to describe the procurement of visible amounts, i.e., macroscopic amounts, of C_{60} and C_{70}. They acknowledged that Huffmann and Kratschmer were they first to achieve this feat by

repeating the process which is exemplified in the Nature article published in 1990 by Huffmann and Kratschmer and the details of this process are also described in the present application. Thus, they admit that Huffmann and Kratschmer were the first to isolate macroscopic amounts of same. They state, for example, that Huffmann and Kratschmer

"... were the first to observe the roundest of all round molecules..."

Id. Page 54-57.

They "were looking at the first concentrated bottom of fullerenes ever seen."

Thus, they admit that the Huffmann-Kratschmer process produced macroscopic amounts of C_{60} and C_{70}.

Moreover, inasmuch as the benzene solution was colored, it meant to one of ordinary skill in the art that macroscopic amounts of fullerenes e.g., C_{60} were present in the colored benzene solution described in the instant application.

Moreover, if one repeated the teachings described in the instant application, as testified by both Dr Kroto, a Nobel Prize laureate and Dr. Loufty in their respective Declarations, infra, one would find that macroscopic amounts of fullerene, e.g. C_{60}, were present in the benzene solution obtained in accordance with the process described in the instant application. The present inventors accomplished what Curl et al could not accomplish at the time of filing the application, and that is the production of fullerenes, e.g. C_{60} is macroscopic amount. Contrary to the allegation in the Examiner's Answer, the fact that Curl et al were unable to make macroscopic amounts supports the inventiveness and patentability of the present invention.

Additional evidence that the instant application readily conveys to one of ordinary skill in the art that the Appellants were in possession of macroscopic amounts of fullerenes, is found on Page 4 thereof:

> ...In the production of C_{60} and C_{70}, any procedure for vaporizing carbon can be used, although the preferred method relies on the use of a high intensity electrical current with graphite rods as electrodes. These rods are constructed to permit vaporization of carbon at the tip of the rod to produce a high density vapor of carbon.

The high density of carbon vapor produced by the vaporization of graphite facilitated the formation of fullerenes, e.g., C_{60}, in macroscopic amounts. As evidence thereof, attention is directed to the Loutfy Declaration of record, Paragraph 15:

> ...Even though it appears simple to the uninformed, especially in hindsight, the process of Dr. Kratschmer and Huffman as described in the subject application, is a remarkable discovery, which produced a high density of vapor of carbon as described on Page 4 of the subject application which resulted in the formation of macroscopic amounts of fullerenes by their method. From 1985, when Dr. Smalley, et al. at Rice University discovered the existence of C_{60} and C_{70} atoms by spectrographic analysis of a vapor (see paragraph 12 above), until Dr. Huffman, et al. published their discovery in 1990 no one else realized how to produce and recover macroscopic quantities of these fullerenes, despite the availability of equipment that could have been used for this purpose.

Paragraph 15 of Loutfy Declaration:

The formation of the high density of carbon vapor was lacking in the previous methods reported in the literature. One of ordinary skill reading the specification at the time of the filing of the application understood that by forming a high density of carbon vapor, the Appellants

were able to produce macroscopic amounts of fullerenes, e.g., C_{60}, by their method. Thus, this passage is further evidence that the application as originally filed reasonably conveyed to one of ordinary skill in the art that the inventors had possession of a process for making macroscopic amounts of fullerenes, e.g., C_{60}.

There are other indices in the instant application that evidence to one of ordinary skill in the art that the instant application describes the process of making macroscopic amounts of fullerenes, e.g., C_{60}.

For example, the instant application on Page 7, lines 24-25, describes that the product produced by sublimation of the carbon soot is obtained as a brown to gray coating and the color is brown to gray, depending on the thickness of the coating. In other words, the color differentiated between the amount of fullerene that was present on the sublimation collecting surface. This fact is also consistent with macroscopic amounts of product, e.g., C_{60}, being formed. One of ordinary skill in the art can observe differences in color with the naked eye and utilize this difference in color to determine relative amounts of fullerene, e.g., C_{60}, product formed. One need not resort to the use of a microscope, or other instruments to determine the presence of fullerene, e.g., C_{60}.

In addition, the application describes on Page 7, lines 19-22 that the product obtained from extraction is a dark brown to black crystalline material. The fact that the one sees colors and utilizes the color to differentiate between the different products indicates to one of ordinary skill in the art that the product was produced in amounts that can be seen with the human eye, as color is something that the human eye can perceive and differentiate.

In addition, attention is directed to Example 1 of the instant specification wherein it is specified that the C_{60} product is obtained as a powder and wherein the color of the product

produced therefrom is indicated. Obviously, the isolation of a product as a powder taken together with the fact that it is a colored powder connotes that the product could be seen with the naked eye, consistent with the use of the term "macroscopic amounts", as recited in the claims. As shown hereinbelow, Dr. Kroto testifies that this fact evidences that the instant application reasonably conveys to one of ordinary skill in the art that the inventors had possession of a process of making macroscopic amounts of fullerenes, e.g., C_{60}. See Kroto Declaration, dated Nov. 16, 1999, Paragraph 15.

As further evidence that the instant application reasonably conveys to one of ordinary skill in the art that the inventors had possession of macroscopic amounts of fullerenes at the time of filing, of the application, attention is directed to the Declaration of Dr. Kroto, a Nobel Prize laureate, of record. Dr. Kroto testified that the instant application reasonably conveyed to one of ordinary skill in the art that the inventors were in possession of macroscopic amounts of fullerenes, e.g., C_{60}, at the time of filing the application. See, for example, Paragraph 3 of the Declaration of Kroto dated July 27, 1995 wherein he attests that "[s]pecifically, the application described the production of C_{60} and C_{70} in macroscopic amounts, i.e., amounts that could be seen with the naked eye." See also Paragraph 3 of the Declaration of Kroto dated June 9, 1995. Attention is further directed to the Kroto Declaration dated June 9, 1995, at Paragraphs 14 and 15, in which he attests that the application adequately describes the method for making macroscopic amounts of fullerenes, such as C_{60} and C_{70}, and that based upon the teachings in the application, it is his opinion that the inventors had in their possession at the time of the filing of the application macroscopic amounts of same. Furthermore, Dr. Kroto refers to the fact that the colored powder formed in Example 1 connotes macroscopic amounts of fullerenes as discussed

hereinabove. More specifically, attention is directed to Paragraph 15 of Dr. Kroto's Declaration dated November 16, 1999, wherein he states:

> Moreover, the specification provides evidence in several instances that the inventors had produced the fullerene products, including C_{60}, in macroscopic amounts. For example, attention is directed to Example 1, which describes the product thereof in powder form as brownish-red. Such language connotes, in my opinion, that the product thereof could be seen with the naked eye. Moreover, based upon repetition of the process described therein, as described hereinbelow, the process as described in the above-identified application, especially in Example 1, inherently produces fullerenes, e.g., C_{60}, in amounts that could be seen with the naked eye...

As further evidence, Kroto testified in the Kroto Declaration dated November 16, 1999, in Paragraph 15 that by following the procedure described in the above-identified application, he had invariably produced fullerenes, e.g., C_{60} in macroscopic amounts. As Kroto testifies in Paragraph 15 of the Declaration:

> ...Moreover, based upon repetition of the process described therein, as described hereinbelow, the process as described in the above-identified application, especially in Example 1, inherently produces fullerenes, e.g., C_{60}, in amounts that could be seen with the naked eye.

Dr. Kroto further testifies in Paragraphs 17, 18 and 19 of the Declaration dated November 16, 1999, as follows:

> 17. Utilizing the procedure exactly as described in the above-identified application, I have had fullerenes, including C_{60}, prepared in macroscopic amounts on numerous occasions since 1990 to the present. More specifically, by following the procedure described in the above-identified application and vaporizing graphite rods in an atmosphere of helium, forming the

carbon soot therefrom, collecting the soot and dissolving the soot in benzene, in accordance with the procedure described in the above-identified application, I and my colleagues have prepared and identified various fullerenes, including, inter alia, C_{60}...

18. Moreover, by following the procedure described in the above-identified application, and in accordance with the procedure outlined in Paragraph 17 herein, we have isolated fullerenes in macroscopic amounts, as defined herein. For example, utilizing the procedure outlined in Paragraph 17, I have found that the smoky carbon product contains 5 to 10% C_{60} and 1% C_{70}. We routinely produce the soot in 1-5 gram quantities and routinely extract 100-500 milligram amounts batchwise. Thus, one kilogram of sooty carbon product produces, on average, 100g of C_{60}, 10g of C_{70} and 1 gram of other fullerenes, such as those indicated hereinabove. The various fullerenes formed can and are isolated in accordance with the isolation and purification procedures described in the above-identified application, without an undue amount of experimentation. Furthermore, the various fullerenes are isolated as solids, which are easily visible to the naked eye. For example, in a typical experiment conducted according to the procedure described in the above-identified application, C_{60} is formed in about 100 mg quantities, C_{70} in about 10 mg quantities and the remainder in about 1 mg quantities.

19. Thus, by following the procedure described in the above-identified application, I have found that the process described therein inherently produces ... C_{60}, in macroscopic amounts. In fact, by following the procedure of Kratschmer and Huffman, outlined in the above identified application, crystalline material of fullerenes, including C_{60}, is produced which can be seen with the naked eye. (Emphasis added.)

Thus, by following the procedure described in the application, Dr. Kroto testified that he obtained macroscopic amounts of fullerene, e.g. C_{60} and C_{70}.

As further evidence thereof, attention is directed to the Declaration of Raouf Loutfy, another expert (hereinafter "Loutfy Declaration"). In his Declaration, Dr. Loutfy testified that by following the teachings in the instant application, macroscopic amounts of fullerenes, e.g., C_{60} and C_{70} were provided:

> 11. Although the subject patent application of Dr. Kratschmer and Huffman does not expressly use the term "macroscopic amounts" to describe the amounts of fullerenes, e.g., C_{60} and C_{70} first isolated by them, in accordance with the teaching of the process described therein, the fullerenes, e.g., C_{60} and C_{70}, that were prepared in accordance with the process described herein, were produced in measurable amounts that were visible to them, and it is my professional opinion that these amounts are inherently amounts definable by the term "macroscopic amounts".

Paragraph 11 of the Loutfy Declaration.

As testified by Dr. Loutfy, he repeated exactly the procedure described in the underlying application utilizing graphite rods of one quarter inches in diameter, as described in the instant specification, as for example, on Page 6, line 32 to Page 7, line 1 of the instant specification. Dr. Loutfy testified that he vaporized the graphite, in accordance with the teachings in the application. By following the procedure described therein, he produced macroscopic amounts of fullerenes, e.g., C_{60} and C_{70} (See Paragraph 17 of Loutfy Declaration):

> 17. I repeated exactly the Huffman et al. process according to the teaching described in the subject application including example 1 using ¼ inch in diameter graphite rod, at 100 torr Helium, using 100 ampere dc current. This graphite vaporized, and the vapor was condensed on a water cooled surface. The vaporization was performed for 50 minutes

> using about 17 cm length of the graphite rod and produced 12 gram of soot. The fullerenes were recovered using toluene and the amount of fullerene was determined. The yield of fullerene was about 8 to 10%. Accordingly, the total recoverable fullerenes was over 1.2 grams with over 900 mg of C_{60} and over 200 mg of C_{70} and the remaining other fullerenes...(Emphasis added)

Loutfy Declaration, Paragraph 17

Based upon the teachings in the instant application, Dr. Loutfy calculated the amount of C_{60} and C_{70} produced by the inventors in Example 1, and concluded that the amount produced was, without question in macroscopic amounts. See Paragraphs 17 and 18 of Loutfy Declaration:

> ...According to the teaching in the subject application where they vaporized a ¼" graphite rod with 1 cm length, the inventor must have produced at least about 600 mg of soot that contains admixture of at least 63 mg of fullerenes that contain at least about 50 mg of C_{60} and at least about 10 mg of C_{70}. A 600 mg quantity of soot certainly can be seen by the naked eye, as also indicated by the inventor that "heavy block coating on collecting substrates and/or on the walls of the chamber which can be easily scraped off for the recovery step." Also, the 60 mg of fullerene certainly can be seen by the naked eye and it is measurable. Furthermore, the 45 and 10 mg of C_{60} and C_{70} respectively are also measurable, in today modern laboratory facility amount as low as 0.1 mg can be measured, and can be seen by the naked eye.
>
> The same conclusion can be reached by simply calculating the mass of the rod vaporized in Kratschmer et al. subject application, including example 1, which is easily determined from the diameter of the graphite rod they used (1/4"), the length (1 cm), and typical density of the type of graphite used for graphite vaporization (2.0 g/cc). This calculation estimates that about 633 mg of soot

> containing fullerenes was produced by Kratschmer et al., which is certainly macroscopic and in agreement with the above-presented experimental data.
>
> Moreover, if a longer graphite rod were used, the amount of C_{60}, C_{70} and other fullerenes produced would even be greater, as shown herein above. (Emphasis added).

Loutfy Declaration Paragraphs 17 and 18.

Thus, as indicated by Dr. Loutfy, macroscopic amounts of, e.g., C_{60} were produced in Example 1 of the instant application. As further testified by Dr. Loutfy at Paragraph 18:

> It is my opinion that the inventors of this subject application were the first to isolate and recover a measurable or macroscopic amount of fullerenes, and to teach others to do so. Their description in the application is clearly understood by ordinary skilled artisans, and when repeated by us allowed us to produce visible, measurable commercial quantities of fullerene product, commonly described as "macroscopic quantities".

Loutfy Declaration Paragraph 18.

Thus, Dr. Loutfy testifies that the process of the present invention inherently produces fullerenes, e.g., C_{60} and C_{70}, in macroscopic amounts (See Paragraph 11 of Loutfy Declaration). Dr. Loutfy further testifies that when he performed an experiment based upon the teachings in the underlying application, including Example 1, in which a graphite rod ¼ inch in diameter and 17 cm long, was vaporized at 100 torr Helium using 100 ampere dc current for about 50 minutes, he produced 12 grams of soot. He extracted the soot with toluene and the yield of fullerene was about 8 to 10%. Thus, he recovered over 1.2 grams of fullerene, with over 900 mg of C_{60} and over 200 mg of C_{70}. See paragraph 17 of Loutfy Declaration. Since amounts as low as 0.1 mg can be seen with the naked eye, this amount of C_{60} and C_{70} can be seen with the naked eye. Id.

Dr. Loutfy further testified that if he utilized a shorter length of graphite such as 1 cm length, as discussed in the underlying application including Example 1, he still produced macroscopic amounts of fullerene including 50 mg of C_{60} and 10 mg of C_{70}, which is still greater than the lower limit of 0.1 mg seen with the naked eye. Furthermore, if one calculates the amount of soot that would be produced from a 1 cm length and ¼ inch diameter graphite rod, the calculation would estimate that 633 mg of soot would be produced. Id. If one assumes 10% yield, then approximately about 66 mg of C_{60} and about 53 mg of C_{70} would be produced, which amounts are well above the amount that could be seen with the naked eye. Further, if a longer graphite rod were used, the amount of C_{60} and C_{70} produced would be even greater. Again, this provides ample evidence that the C_{60} and C_{70} produced in accordance with the present process is in macroscopic amounts.

Attention is further directed to U.S. Patent No. 6,077,401, attached to the Loutfy Declaration which indicates in Column 2, lines 11-38 thereof that rods with ¼ inch diameter are capable of producing yields of around 15%. Consequently, since the amounts testified by Dr. Loutfy in the Loutfy Declaration assumed yields of 8-10%, this means that the amount of C_{60} and C_{70} produced in the experiment conducted by Dr. Loutfy can be even higher, further supporting appellants' position that the underlying application provides an adequate description of fullerenes, e.g. C_{60} and C_{70} in macroscopic amounts.

Thus, there is no question that the underling application produces C_{60} and C_{70} in macroscopic amounts.

The Office Action and Examiner's Answer dismisses the Loutfy Declaration alleging that it is speculative. Further, the Office Action further alleges that statements made by Loutfy in the

Loutfy Declaration are opinions. Appellants respectfully submit that this is an inaccurate and incorrect characterization of the testimony of Dr. Loutfy.

The statements by Dr. Loutfy are based on his experimental findings. Attention is directed to Paragraphs 17, et seq., of Loutfy Declaration which described the experiments performed by Dr. Loutfy upon which he bases his conclusions. As Dr. Loutfy testified, he repeated the process described in the above-identified application, and from his results, he calculated the amount of, inter alia, C_{60} and C_{70} produced by the process. From his data, Dr. Loutfy concludes that the C_{60} and C_{70} prepared by the process described in the instant application are each produced in amounts that are visible to the naked eye, that is, in macroscopic amounts. The point regarding changing the length of the rod was to emphasize the accuracy of the calculations made. Thus, the data provided in Dr. Loutfy's Declaration further supports that the inventors at the time of the filing of the instant application were in possession of macroscopic amounts of C_{60} and C_{70}. Further, it is noted the term Macroscopic is used in the normal everyday sense, i.e., in amounts that could be seen. Thus, the fact that scientists following the procedures described in the instant application and obtain products comprising fullerenes, e.g. C_{60} and C_{70}, in macroscopic amounts, is evidence that the present application conveys to one of ordinary skill in the art that the inventors, at the time of filing the underlying application, were in possession of macroscopic amounts of fullerene, e.g. C_{60} and C_{70}.

In fact the scientific community has recognized that the process of Huffman and Kratschmer, et al. which is exemplified in the article by Kratschmer, et al., Nature, 1990, 354, produces fullerenes, e.g., C_{60} or C_{70} in macroscopic amounts. Attention is directed to Column 1, lines 58-61 of U.S. Patent No. 6,077, 401, which is attached as Exhibit 2 to the Loutfy Declaration. The '401 patent indicates that Huffman and Kratschmer were the first to isolate

macroscopic amounts of C_{60}. In addition, attention is directed to the article by Curl and Smalley in which they admit that Huffman and Kratschmer were the first to isolate fullerenes, e.g., C_{60} and C_{70}, in macroscopic amounts. The process described in the Nature article is the same as the process described in the application.

It is to be noted that Huffman and Kratschmer, along with Smalley and Kroto, were given the 1994 Hewlett Packerd Europphysics Prize by the European Physical Society for their discovery of fullerenes. In addition, only Huffman and Kratschmer and not Smalley, et al. were awarded the 1993 Materials Research Society Award for Synthesis and Pioneering Study of Fullerenes. These awards and the accompanying information show that Huffman and Kratschmer discovered fullerenes. Furthermore, the Swedish Academy in their press release awarding the Nobel Prize to Kroto, and Smalley, et al., acknowledged the contributions of Huffman and Kratschmer for being the first to make macroscopic amounts of fullerenes. The process which they used to isolate the C_{60}, C_{70} and other fullerenes in macroscopic amounts is the process which is described in the underlying application and exemplified in the Nature article.

Accordingly, one can reach only one conclusion with respect to the issue of the written description for the term "macroscopic amounts of C_{60} and C_{70}"; that is, there is adequate support, in compliance with the description requirement of 35 U.S.C. §112, first paragraph for the term "macroscopic" amounts of C_{60} and C_{70}.

Thus, contrary to the allegations in the Final Rejection and the Examiner's Answer, there is adequate support in the application for the term "macroscopic" amounts with respect to C_{60} and C_{70}. Thus, for the reasons provided herein, the rejection of Claims 53-72, 86, 107, 111-114,

and 165-170 under 35 U.S.C. §112, first paragraph is in error, reversal thereof is respectfully requested.

2. THERE IS ADEQUATE WRITTEN DESCRIPTION IN THE SPECIFICATION FOR THE SOOTY CARBON PRODUCT RECITED IN CLAIMS 119, 122-132.

As defined in the specification, the sooty carbon product is a product that comprises (contains) macroscopic amounts of C_{60} and C_{70}. The evidence and the rationale that support the conclusion that there is adequate support for the subject matter therein is described hereinabove, the contents of which are incorporated by reference. Further evidence that the sooty carbon product contains macroscopic amounts of C_{60} and/or C_{70} is the fact that such amounts can be extracted therefrom to obtain a colored powdered or colored solution or colored film of C_{60} and/or C_{70}. The color of the products as well as the powder form can be discerned only if they were produced in amounts that could be seen with the naked eye, i.e., macroscopic amounts. Using the same rationale as described hereinabove, the contents of which are incorporated by reference, only one conclusion can be drawn -- macroscopic amounts were produced.

Therefore, the rejection of Claims 119, 122-132 under 35 U.S.C. §112, for allegedly lacking descriptive support is in error; reversal thereof is respectfully requested.

3. THERE IS ADEQUATE WRITTEN DESCRIPTION IN THE SPECIFICATION FOR THE SOLID CARBON PRODUCT DESCRIBED IN CLAIMS 141-162

The description in the specification for the formation of the solid carbon product also complies with the description requirements of 35 U.S.C. §112, first paragraph. The application describes the isolation of the solid, and in fact exemplifies a solid comprising macroscopic amounts of C_{60}. Furthermore, a means of determining that the product was a solid comprised predominately of C_{60} was that it was sublimed and could be seen with the naked eye. It is to be noted that the application does not describe or state that the powder was only observed using instruments. The absence of such language connotes to one of ordinary skill in the art that it, e.g. C_{60} or C_{70}, was seen with the naked eye. Moreover, as shown by the data, this powder was relatively pure and contained predominately C_{60}.

Moreover, it be to be noted that a element of the claims 141-162 requires that macroscopic amount of C_{60} and/or C_{70} is separated from the sooty product by collecting and subliming the product and condensing the solid carbon product. Sublimation is a purification technique. What was collected was predominately C_{60}. Sufficient C_{60} had to be produced in order for the sublimed material to be removed off the collecting surface. In order to remove it off the collecting surface, it had to be seen. What was seen was crystalline C_{60}. See for example, Ex. 1. Thus, C_{60} was specifically exemplified to be made in macroscopic amounts.

Thus, the support and rationale for the subject matter in Claims 141-162 is the same as described above, the contents of which are incorporated by reference.

IV. THE REJECTION OF CLAIMS UNDER 35 U.S.C. §101 IS IMPROPER AS IT IGNORES LIMITATIONS RECITED IN THE CLAIMS

Pursuant to the rejection of Claims 45-51, 53-75, 77, 80, 81, 83, 86, 88, 92, 93, 96-107, and 109-180 under 35 U.S.C. §101, the Office Action alleges that these claims, absent the recitation of the term "macroscopic" or equivalent language thereto which the Office Action alleges is new matter - - a position with which applicants disagree- - embrace products found in nature. Applicants strongly disagree.

Each of the claims pending recite the limitation of "macroscopic amounts of quantities" and/or equivalent language thereto. This language must be read into the claims and cannot be ignored. Moreover, as indicated by the Board of Patent Appeals and Interferences in its Decision, dated September 25, 1999 wherever C_{60} and/or C_{70} are found, they have not been found in macroscopic amounts. Attention is directed to the fact that the Board of Appeals and Interferences ruled in its Decision dated September 25, 1999 that the scope of Claims 45-81, 83-86 and 88-180 are not unpatentable under 35 U.S.C. §101. See Page 49 of the Decision dated September 25, 1999. The Office Action alleges, by referring to the earlier Action that this rejection only applies if applicants delete the term "in macroscopic amounts" in the claims. Inasmuch as this term or equivalent language thereto is recited in the pending claims, this rejection is not applicable. See, for example, Claims 53-72, 86, 96, 102, 103, 106, 107, 111-114, 119, 122-132, 141-157, and 162-170. For instance, Claim 53 recites as one of the elements thereof that the carbon product contains macroscopic amounts of C_{60}. This, limitation is also present in Claims 54-72 and 153, which are either dependent upon or ultimately dependent on Claim 53. Claim 86 recites that C_{60} is present in macroscopic amounts, Claim 102 recites a macroscopic amount of substantially, pure C_{60}, while Claim 103 recites macroscopic amount of

substantially pure C_{70}. As discussed below, Claim 104-107 require the presence of a macroscopic amount of C_{60} or C_{70}. Claim 111 requires that C_{60} be present in macroscopic amounts while Claim 112 requires that C_{60} be present in macroscopic amounts. Claims 141-152 and 154-157 require that a macroscopic amount of C_{60} be separated from the soot. Thus, explicitly, if not implicitly, the product contains macroscopic amount of C_{60}. Claims 165-170 are also directed to products containing macroscopic amounts of C_{60} or C_{70}. All of these claims contain macroscopic amounts of C_{60} or C_{70}. However, the Office Action alleges that the rejected claims do not contain such term. First, the rejection of these claims on this basis is inconsistent with the statement in the Office Action referred to in the rejection of November 30, 1993. According to rejection, Claims 86, 96, 102-108, 111-114, 119, 141, 162 and 165-168 were rejected if applicants delete the term "macroscopic amounts" in the claims. However, as indicated hereinabove, the term "macroscopic amounts" are included in the claims referred to hereinabove. Thus, there is an inconsistency.

Moreover, to support the rejections under 35 USC § 101, the United States Patent and Trademark Office cited an article by Buseck et al in Science, 237, pp 215-216. This article alleges that C_{60} and C_{70} occur within the fraction filling films in shungite. The article alleges that these fullerenes are present in "minor amounts" and are unevenly distributed. According to the article, any C_{60} or C_{70} therein was found randomly distributed in the rock and when present, occurs only within the fracture filling films in shungite. Furthermore, the article admits that C_{60} and C_{70} in those regions could not have been identified if its weren't for the fact that C_{60} and C_{70} were known at the time of their alleged discovery, citing the work of the present inventors. But, it is clear that the fullerene in shungite is not present therein in macroscopic amounts, as recited, in the aforementioned claims. Even the Decision by the Board dated September 25, 1999 held

that the article does not teach that macroscopic amounts of fullerene, e.g. C_{60} and C_{70} are naturally found. Thus, the subject matter in Claims 53-72, 86, 103, 104-107, 111, 112, 141-152, 153, 154-157, and 165-170 are not found in nature.

Moreover, Claims 113, 114 and 122-132 are directed to sooty carbon products from which macroscopic amounts of C_{60} and or C_{70} can be isolated. Thus, the term macroscopic appears in these claims and the maintenance of the rejection of these claims is inconsistent with the statement in the Office Action that claims containing the term macroscopic amounts are not being rejected. Moreover, the rejection of November 30, 1993, referred in the Final Rejection specifically identified Claims 113, 114 and 119 as not being rejected. Inasmuch as Claims 120-132 are dependent on Claim 119 and Claim 119 cites macroscopic therein, it is respectfully submitted that this limitation is contained in Claims 120-132. Thus, the rejection of Claims 113, 114, 119 and 122-132 in the Examiner's Answer is inconsistent with the Rejection in the Examiner's Answer.

Moreover, the rejection of Claims 111-114, 119 and 120-132 under 35 USC § 101 is in error for still another reason. According to the Final Rejection, Claims 113, 114, 119 and 122-132 is rejected under 35 USC §101 as defining a natural product, as described in the article by Buseck, et al, referred to hereinabove. But a review of the Buseck, et al. article clearly reveals that there is no mention therein of a sooty carbon product. Thus, the United States Patent and Trademark Office has not provided any evidence to support its allegation that the subject matter in the aforementioned claims is a product of nature. None of the evidence provided by the United States Patent and Trademark Office refer to any sort of soot containing C_{60} or C_{70}, which is capable of producing therefrom C_{60} or C_{70} in macroscopic amounts. This is quite apparent, especially since none of the articles cited by the United States Patent and Trademark Office

found any soot containing any fullerenes - - let alone C_{60} or C_{70}. Furthermore, even assuming pro arguendo, that there was soot containing C_{60} or C_{70}, since C_{60} or C_{70} have not been found in macroscopic amounts in nature, any soot containing C_{60} and C_{70} would not be capable of producing C_{60} or C_{70} in macroscopic amounts. Thus, the United States Patent and Trademark Office cannot rely on Buseck et al to support that the subject matter in Claims 113, 114, 119 and 122-132 is a product of nature.

Consequently, for the reasons given herein the subject matter of Claims 113, 114, 119 and 122-132 do not encompasss products products of nature.

However, there are claims in which the term "macroscopic" does not specifically appear, but even these claims do not encompass products of nature.

Independent claims in which the term "macroscopic amounts" does not appear include Claim 73, which recites, "a formed or molded product comprising crystalline C_{60}"; Claim 75, which recites "a free flowing particulate comprised of crystalline C_{60}"; Claim 80, which recites "a formed or molded product comprising solid C_{70}"; and Claim 81, which recites "a free flowing particulate comprising solid C_{70}". But, no evidence has been presented that the products found in nature alleging to contain C_{60} or C_{70} is a formed or molded product, as recited in the claims. The only evidence that the United States Patent and Trademark Office Presented in support of its rejection under 35 USC §101 is the teachings of Buseck, et al., which describes fullerene deposits in the shungite. However, it is clear that shungite is a rock and is not a molded or formed product comprising C_{60} or C_{70} as recited in Claims 73 and 80 respectively. Moreover, there is no evidence that the shungite is a free flowing particulate comprising crystalline C_{60} or solid C_{70} as recited in Claims 75 and 81, respectively. In fact, since shungite is a rock, it is

definitely not a free flowing particulate. Thus, Claims 73, 75, 80, 81, and claims dependent thereon do not read on a natural product for still another reason.

The same rationale also applies to Claims 104-107. They all recite that C_{60} or C_{70} is present in macroscopic amounts. As such these products are not found in nature for the reasons described hereinabove which are incorporated by reference. Moreover, Claims 104-107 also recite, in addition, similar language to claims 73, 75, 80 and 81. More specifically, Claims 104-107 are reproduced hereinbelow:

104. A formed or molded product comprising C_{70}, said C_{70} being present in a macroscopic amount.

105. A free flowing particulate comprising C_{70}, said C_{70} being present in a macroscopic amount.

106. A formed or molded product comprising C_{60}, said C_{60} being present in a macroscopic amount.

107. A free flowing particulate comprising C_{60}, said C_{60} being present in a macroscopic amount.

Again, there is no evidence that in nature, wherever they are found, C_{60} or C_{70} is present in a formed or molded product as recited in Claims 104 and 106. Further, inasmuch as the fullerenes are naturally found in fracture – filling films in shungite, a carbonbonaceous rock, it is not naturally found as a free –flowing particulate, as recited in Claims 105 and 107. Thus, Claims 104-107 do not recite products of nature for a second reason.

Claims 92 and 93 are directed to crystalline C_{60} and C_{70}, respectively. However, no evidence has been presented that C_{60} or C_{70} when naturally found is crystalline. Thus, for still another reason, Claims 92 and 93 do not read on a natural product.

These are the only claims that are pending and are rejected which do not recite the term "macroscopic amounts therein". Thus, none of the rejected claims read on products of nature.

The Office Action raised a new ground of rejection which was not discussed or described heretofore in the Final Rejection. More specifically, the Office Action alleges

> "Concerning the 101 rejection, it stands to reason that macroscopic amounts of fullerene are made by wood-fueled fires, given that flames—particularly from aromatics—are dusty and are black with particulate. Given what is argued by Appellant throughout especially at Brief page 31, visible is equated to macroscopic."

This issue was not raised or discussed in the Final Action referred to in the Examiner's Answer. Nowhere does the Official Action make the allegation that macroscopic amounts of fullerenes are found in wood-fueled fires. The teachings of Buseck, et al. which was used as evidence in support of the 101 rejection does not refer to wood – fueled fires – let alone the amount of fullerenes found therein. This issue is raised for the first time in the Examiner's Answer.

The Examiner's Answer, however, did not designate this as a new ground of rejection, as required by 37 CFR § 41.37. Thus, the Examiner's Answer is not in compliance with the 37 CFR § 41.37.

Moreover, in order to fully respond thereto, Appellants have an article, which was presented during the prosecution of the underlying application in a Response dated March 1, 1993. The article is written by Malhotra, et al. in the Journal of Physical Chemistry, 95, 1599-1601 (1999) ("Malhotra, et al.,"). However, Malhotra, et al. was not made of record in this appeal because it was not relevant to the issues raised in the Final Rejection. Accordingly, based on Appellants interpretations of the new rules, there is no mechanism available for Appellants to make this article of record in the appeal since 37 CFR §§ 41.37 and 41.41 do not permit new evidence to accompany a Reply Brief.

Accordingly, Appellants have filed a Petition concurrently herewith, petitioning the Examiner to designate this as a new ground of rejection, thereby given Appellants the option of reopening of prosecution and/or maintain the appeal. Alternatively, Appellants have petitioned to allow Malhotra, et al. to become of record so as maintain the Appeal. A copy of the Malhotra, et al. is attached to the Petition, the contents of which are incorporated by reference.

Nevertheless, it is apparent that this rejection is defective for several reasons. The USPTO has not met its burden of proof on this ground of rejection. The USPTO has not presented any evidence that the wood – fueled fires produces macroscopic amounts of fullerene. The USPTO characterizes the rejections as "It stands to reasons", indicating that the USPTO is speculating on this issue. It has not provided any evidence that wood fueled fires contains fullerene. It has not cited any publication to substantiate its position. It did not present any evidence on this issue. Thus, the USPTO has not met its burden on this issue.

Moreover, evidence of record presented during the prosecution of the underlying application clearly show that the allegation by the USPTO is incorrect. Attention is directed to an article by Malhotra, et al. in the Journal of Physical Chemistry, 95, 1599-1601, 1991, ("Malhotra, et al.") which was made of record in the Response dated March 1, 1993. Malhotra, et al. disclose that soots resulting from pyrolysis and combustion of organic materials do not contain macroscopic amount of fullerenes and do not generally lead to soot with fullerene structure. Thus, Malhotra, et al. refutes the allegations in the Examiner's Answer that soot from wood fueled fires contain macroscopic amounts of fullerene.

Thus, for the reasons presented herein, the rejection of Claims 45-51, 53-75, 77, 80, 81, 83, 86, 88, 92, 93, 96-107, and 109-180 under 35 U.S.C. §101 is in error, reversal of this rejection is respectfully requested.

V. THE CLAIMED SUBJECT MATTER IS NOT ANTICIPATED OR RENDERED OBVIOUS BY THE TEACHINGS OF KROTO, ET AL.

1. Summary

Kroto et al. never made macroscopic amounts of C_{60} or C_{70}, a requirement of the pending claims, a fact substantiated by Curl et al. At most tens of thousands of C_{60} were produced. This amount was too little to see with the naked eye or to even obtain a colored product. Thus, inasmuch as Kroto et al. never made C_{60} in macroscopic amounts, the teachings therein do not anticipate the subject matter in the claimed subject matter.

Moreover, inasmuch as Kroto et al. could not make C_{60} or C_{70} in macroscopic amounts, since the reference did not teach disclose or suggest C_{60} and C_{70} in macroscopic amounts and since it was not known prior to the filing of the application how to prepare C_{60} or C_{70} in macroscopic amounts, Kroto et al (with Curl et al. to show an inherent state of fact) do not render obvious the claimed subject matter.

2. THE SUBJECT MATTER OF CLAIMS 73, 75, 80, 81, 84, 89, 92 AND 93 IS PATENTABLE OVER KROTO ET AL.

The Examiner's Answer rejected Claims 73, 75, 80, 81, 84, 89, 92 and 93. under 35 USC § 103 as allegedly anticipated by or in the alternative under 35 USC §103 as allegedly obvious over Kroto et al in view of Curl et al to show a state of fact. It did not maintain its rejection at this time on this ground of Claims 53-72, 86, 96, 102-107, 111-114, 119, 141, 162 and 165-168, which were raised in the Final Action. Thus, it appears that Claims 53-72, 86, 96, 102-107, 111-114, 119, 141, 162 and 165-168, are no longer being rejected on this ground, and it is so assumed that the United States Patent and Trademark Office has withdrawn its rejection of same respecting these claims.

The rejected claims recite crystalline C_{60} or C_{70} or solid C_{60} or C_{70} or solid C_{60} containing macroscopic amounts of C_{60}. (See, e.g., Claims 73, 75, 80, 81, 92, 93) or substantially pure C_{60} or C_{70} (See, e.g., Claims 84 and 89). Each of these claims are argued separately. Thus, for example, Claims 84 and 89 are argued separately from the other claims.

Kroto, et al. never isolated any solid or comprising crystalline C_{60} or C_{70}, or C_{60} in solid form containing macroscopic amounts. In fact, they never isolated any product in the solid form at all. Thus, the pending claims are patentable over the prior art.

Kroto, et al. report on the detection of C_{60} and C_{70} using time of flight mass spectrometry in the vapor phase. However, they never isolated or recovered visible particles of C_{60} and C_{70}. They never produced C_{60} or C_{70} as a solid or in solid form, let alone crystalline C_{60} or C_{70}. See, Curl, et al. See, also Loutfy Declaration Paragraph 12. In addition, they did not disclose a process that would teach or lead others to do so. See, Curl, et al. and Loutfy Declaration, Paragraph 2. Kroto, et al. admit that they only C_{60} made in small amounts. As described in Curl, et al., on page 54,

> they could "not collect more than a few tens of thousands of the special new molecules [fullerene]. This amount was plenty to detect and probe with the sophisticated techniques available in our laboratory, but there was not enough to see, touch or smell. Our evidence was indirect... For now, the fullerenes existed only as fleeting signals."

No matter how much they tried they were always unsuccessful in making amounts sufficient to see, i.e., macroscopic amounts.

Thus, Curl, et al., on commenting about the experiments described in Kroto, et al. admit that they could not make enough to collect the fullerenes as a solid or in solid form or in

macroscopic amounts or equivalent language thereto. Thus, contrary to the allegations in the Office Action, Kroto, et al. never made a solid comprising solid or crystalline C_{60} or C_{70}, as recited in Claims 73, 75, 80, 81, 92 and 93 since Kroto, et al. never made enough to collect a crystalline or solid C_{60} or C_{70}. Thus, the process of Kroto, et al. was not capable of making sufficient amounts of C_{60} or C_{70} to make crystalline C_{60} or C_{70}. The process of Kroto, et al. never formed C_{60} or C_{70} or other fullerenes in any amounts that could be seen with the naked eye or isolated as such as a solid, whether it be in the soot or not. They never prepared solid C_{60} or solid C_{70}. Kroto never made C_{60} or C_{70} in amounts that could be seen, touched or felt. They never made C_{60} or C_{70} in macroscopic amounts. Since they made only a few molecules of fullerenes, they could never isolate C_{60} or C_{70} in solid form, as claimed. Moreover, as a consequence thereof the soot formed in the Kroto, et al. process is not comprised of solid particles consisting essentially of C_{60} or C_{70} or soot capable of producing C_{60} or C_{70} in macroscopic amounts, as claimed.

Thus, the claimed subject matter in Claims 73, 75, 80, 81, 92 and 93 differs from the subject matter described in Kroto in at least one aspect. The claims, as defined, recite greater amounts than that described in Kroto, et al. Since anticipation under 35 U.S.C. §102 requires that the prior art reference discloses each and every element of the claims, and since the absence of an element in the claim relative to the prior art negates anticipation, inasmuch as Kroto, et al. do not disclose the C_{60} and C_{70} being present in the amounts claimed - - an important element of the claims- - the claimed subject matter in these rejected claims does not anticipate the present invention.

Moreover, applicants respectfully submit that the Kroto, et al. article is non-enabling to make fullerenes, e.g., C_{60} or C_{70} in macroscopic amounts or language equivalent thereto, e.g., solid form, as a solid, in macroscopic amounts or in equivalent language.

They never prepared solid or crystalline C_{60} or C_{70}, as presently claimed in Claims 73, 75, 80, 81, 92 and 93. It was not possible to prepare C_{60} or C_{70} solid or, for that matter, C_{60} or C_{70}, in any appreciable amounts, without undue experimentation. As stated in Curl, et al., despite extensive efforts by the scientific community, no one prior to Kratschmer and Huffmann was successful in preparing C_{60} or C_{70} in any appreciable amounts. Consequently, Kroto, et al. do not teach, disclose, or even suggest solid C_{60}, or solid C_{70}, crystalline C_{60}, crystalline C_{70}, solids consisting essentially of C_{60} or C_{70}, etc., or any matter comprised of solid C_{60} or C_{70} as presently claimed.

To be enabling, a reference must describe an invention sufficiently to have placed the public in possession of it. In re Donahue, 766 F.2d 531, 226, USPQ 619 (Fed. Cir. 1985). The printed publication must be enabling. Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 7 USPQ 21 1057 (Fed. Cir. 1988). The test of enablement is whether one reasonably skilled in the art could make or use the invention from the disclosure in the reference coupled with the information known to one skilled in the art without undue experimentation. United States v. Teletronics, Inc., 857 F.2d 778, 775 8 USPQ 21 1217 (Fed. Cir. 1988), cert. denied 109 S.Ct. 1954 (1989).

But, the public was not possessed of a method of preparing, isolating, C_{60} and C_{70}, in the amounts claimed in the present application, including a C_{60} or C_{70} in the solid state. Based on the teachings by Kroto, et al., people skilled in the art were unsuccessful in preparing macroscopic quantities of C_{60} or C_{70}. Despite extensive efforts, no solid of C_{60} or C_{70} could be

made or isolated until these were prepared and isolated by the present inventors. Furthermore, despite extensive efforts, no crystalline C_{60} or C_{70} was ever prepared and isolated by others prior to the filing date of the instant application. Further, no material containing solids comprising solid C_{60} and/or solid C_{70} were made until the present inventors developed the methodology. Thus, Kroto, et al. did not place the public in possession of the applicants' invention.

> It is well settled that prior art under 35 U.S.C. §102(b) most sufficiently describe the clamed invention to have placed the public in possession of it .... Such possession is effected if one of ordinary skill in the art could have combined the publication's description of the invention with his own knowledge to make the claimed invention. Accordingly, even if the claimed invention is disclosed in a printed publication, the disclosure will not suffice as prior art if it was not enabling... In re Donahue, 766 F.2d 531, 533, 226 USPQ 619, 621 (Fed. Cir. 1985).

Moreover, the Court continues that if the reference teaches that attempts to make the invention failed, as in the present case, the reference is non-enabling:

> ...In those cases, the references were deemed insufficient because they stated that attempts to prepare the claimed compounds were unsuccessful. Such failures by those skilled in the art (having possession of the information disclosed by the publication) are strong evidence that he disclosure of the publication was non-enabling. Id.

Furthermore, Kroto, et al. were completely unsuccessful in making, isolating and collecting C_{60} and C_{70} in any appreciable amounts. They only had indirect evidence of what it is that they made. They never made solid C_{60} and C_{70}. They never made or isolated a crystalline form of C_{60} and C_{70}. Whatever they made, they only made it in non-measurable amounts. At best, they could only make molecules of something, only tens of thousands of molecules, which

they could not touch, see or smell. No matter how much they tried, they were always unsuccessful in making more. They could never make enough material to put it in the possession of the public:

> Thus, for five years, we had been searching for a method of producing visible amounts of the stuff. We called our efforts "the search for the vial" because quantum calculations for such a soccer ball shaped carbon molecule suggested it would absorb light strongly only in the far violet of the spectrum....

Curl, et al. at 55.

Contrary to the allegations the Office Action, Kroto, et al. did not make the amounts of fullerenes, e.g., C_{60} or C_{70} in the amounts recited in claims 73, 75, 80, 81, 92 and 93 or place the public in possession thereof. Thus, Kroto, et al. is non-enabling for making the amounts claimed in the present process and cannot be used for that purpose.

Moreover, the rationale of why Kroto, et al. never made macroscopic amounts of C_{60} or C_{70} is described in Dr. Loutfy's Declaration. Dr. Loutfy distinguishes the process of the present invention from that of Kroto, et al. See paragraph 15 of the Loutfy Declaration. More specifically, unlike the prior art, including the process of Kroto, et al., the present process produces a high density of carbon vapor, as described on Page 4 of the subject application, resulting in the formation of macroscopic amounts of fullerenes by the present method. Id. The Kroto, et al. process could not produce a high density of a vapor of carbon. Since Kroto, et al. could not produce a high density of a vapor of carbon by their process, they could not provide C_{60} or C_{70} in macroscopic amounts or as a solid or crystalline solid.

Moreover, there is no evidence that Kroto, et al. produced substantially pure C_{60} or substantially pure C_{70}, as recited in Claims 84 and 89. Kroto, et al. never isolated substantially

pure C_{60} or C_{70} per se. In the experiments, described in Kroto, et al. Kroto, et al. vaporized graphite using laser in a helium atmosphere. The species found may have been ionized at this point. But, even if not ionized, any C_{60} or C_{70} species formed was part of a gaseous mixture, in which the majority of the material was soot (amorphous carbon). As part of a mixture, any neutral C_{60} or C_{70} formed was not substantially pure. The mixture was then (further) ionized and separated in a time-of-flight mass spectrometry. In the mass spectrometer, positively charged fragments were formed. The mass spectrometer then separated the positively charged species. Thus, Kroto, et al. never formed substantially pure C_{60} or C_{70}, since any C_{60} or C_{70} initially formed was a small percentage of a gaseous mixture; and when separated, each was positively charged. Thus, the subject matter in Claims 84 and 89 is not anticipated by Kroto, et al.

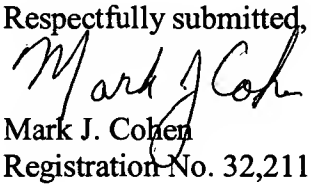
Further, Kroto, et al. never taught, disclosed or suggested C_{60} or C_{70} in macroscopic amounts or in amounts sufficient to isolate as a solid, and the like. The teachings therein are limited to the miniscule amounts described. Further, Kroto, et al. never taught how to make macroscopic amounts of C_{60} or C_{70} or in any amount sufficient to isolate as a solid, and the like. Thus, since one of ordinary skill in the art could not make these amounts of C_{60} or C_{70}, based on the teachings of Kroto, et al. Kroto, et al. do not teach disclose or suggest C_{60} or C_{70} or a crystalline C_{60}, solid C_{70}, or as crystalline C_{60}, as recited in Claims 73, 75, 80, 81, 92 and 93 Finally, since Kroto, et al. never made substantially pure C_{60} or C_{70}, Kroto, et al. never disclosed, described or suggested substantially pure C_{60} or C_{70}, as recited in Claims 84 and 89, respectively.

Thus, the rejection of the specified claims over the prior art is in error. Reversal thereof is respectfully requested.

VI. CONCLUSION

The above arguments clearly overcome the rejections in the Final Action and the Examiner's Answer and clearly establish that all of the claims on appeal are patentable. Affirmance of the patentability and reversal of the Final Rejection of the claims on appeal is respectfully requested.

Respectfully submitted,



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